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SPANISH AGRICULTURE IN THE LONG RUN, 1760-1936. AN INTERPRETATION.

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Abstract

This paper traces the fortunes of Spanish agriculture in the long run, and in the context of the more dynamic changes taking place elsewhere in Europe. I emphasise four points. First, agricultural growth remained limited for long periods because of weak demand. Second, when demand conditions improved, farmers frequently found themselves short of the necessary skills, and marketing networks remained fragile. Third, almost all politicians rejected off-farm migration, the "easiest" way of improving labour productivity before 1936. Finally poor natural resources were not by themselves the major cause of Spain's poor agricultural performance.

Keywords: Agricultural development, Spanish economic development, natural resources.

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Introduction.

This paper traces the fortunes of Spanish agriculture in the long run, and in the context of the more dynamic changes taking place elsewhere in Europe. I emphasise four points. First, agricultural growth remained limited for long periods because of weak urban demand and discrimination in some international markets. Second, when demand conditions improved, farmers frequently found themselves short of skills, and marketing networks remained fragile. Third, I argue that the "easiest" way of improving labour productivity in most of Spain was by encouraging off-farm migration, but this option was rejected by almost all political commentators during our period. Finally, and in conclusion, poor natural resources therefore were not by themselves the major cause of Spain's poor agricultural performance. In fact, natural resources had been excellent for centuries for the production of fine wool for export, and today Spain has a comparative advantage in quality fruit and vegetables. The organisation of the paper is chronological. In the first section I show briefly how traditional Spanish agriculture adjusted to changes in demand over the eighteenth century. In the following section I show the demand restrictions to growth and make a few general observations considering the limited changes in labour productivity in the nineteenth century. The final section shows how "poor" resources began to be once more overcome in the early twentieth century.

1. Growth in traditional agriculture: Spain 1750-1820.

Prior to the late nineteenth century most contemporaries believed that the poor performance of Spanish agriculture was caused by the country's low population density. Despite an increase of about 70 per cent in the century after 1750, there were still only 30 inhabitants per square kilometre in 1850 (Maps 1 and 2).[1] Therefore while Malthus was worrying his contemporaries in northern Europe with fears of overpopulation, Spanish writers were mostly concerned about how to increase it. However, both Malthus and Spanish mercantilists writers believed that a more dynamic agriculture would increase population, and this provided the rationale for many of the projects for agrarian reform in Spain. Yet it seems more likely, as Boserup has suggested, that the main line of causation

[1] For the seventeenth and eighteenth century debates on population, see especially Martín Rodríguez, 1984. The late nineteenth century debate on emigration suggests that little had changed, Sánchez-Alonso, 1995, chapter 2.

runs in the opposite direction. That is population growth was the independent variable, and was itself a major factor determining agricultural development.[2] In other words "undercultivation" in Spain, which many contemporaries complained about, was the result of the low population density, and not its cause. In this paper Boserup's model is extended to include the crucial role played by urban demand and international trade, and used to shed light on long-term changes in Spanish agriculture, and the obstacles to increasing productivity. To understand more clearly both the potential and limits of change in traditional agriculture, I start by considering briefly some recent studies for Northern Europe.

Most of the principle components of the Agricultural Revolution were well know in the Middle Ages, if not earlier.[3] Their reappearance in the Dutch Republic and England during the seventeenth and eighteenth centuries was in response to population growth and urbanisation, and allowed an important increase in crop yields, a decline in the use of fallow, and the switch into more labour intensive, higher value commodities. As a result, between about 1500 and 1800 wheat yields in England doubled, and labour employed in agriculture declined from about 76 per cent of the total labour force in 1520, to 55 per cent in 1700, and just 36 per cent in 1800.[4] Changes also occurred elsewhere. In France, a recent estimate suggests that agricultural labour productivity increased by 27 per cent between 1500 and 1800, about half the rate in England.[5] Although the possibility of achieving widespread changes in farming methods in the face of rapid population growth and rising urban demand is relevant for our argument, it is usually argued that the technological path followed by farmers in England, Holland and northern France was unsuitable to southern Europe, and therefore most of Spain.[6]

Changes in yields and labour productivity in Spanish agriculture are difficult to measure, but some indication of their nature and the direction of change can be noted. In the first instance, the twin problems of summer drought and soil fertility are rightly considered to have produced restrictions to more intensive crop rotations, the growth in

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[2] Boserup, 1965, p.11.
[3] Boserup, 1965, p. 38. See also Ambrosoli, 1997 and Grantham, 1999, pp.210-212.
[4] Allen, 1999, pp.222-4 and Wrigley, 1987, Table 7.4.
[5] Hoffman, 1996, pp.135-6. For the Dutch Republic, see De Vries and van der Woude, 1997, chapter 6.
[6] Tortella (1987, p.51 and more recently, 1994, pp.8-9) is the historian who has most consistently argued the limitations imposed on Spanish agriculture by the poor quality of natural resources. See also Garrabou, 1985.

cereal yields and the possibilities of diversification away from traditional crops. But soil fertility is not fixed in time, but rather is a variable "closely associated with changes in population density and related changes in agricultural methods".[7] Therefore there are two issues here which need to be considered: was Spanish agricultural growth restricted because resource endowments were difficult to improve, or was growth limited because of demand constraints?

Table 1 uses information from Andalucía in the 1920s to classify agriculture in three groups of intensity. First "extensive" farming includes natural pastures, and cereal rotations where at least two thirds of the rotation is left unsown. Second, "average" land use is defined as cereal rotations where only half the land is sown, together with low intensive vines and olives. Finally "intensive" cultivation includes both irrigated land, and those vines and olives with high labour inputs.[8] Despite major regional differences in farming systems, the information in Table 1 can serve as a useful guide for the nature of the obstacles to change in Spanish agriculture. Population growth and rising farm prices, especially in the second half of the eighteenth century, encouraged a switch from one level of intensity to another. Despite the inability to introduce the "new rotations" of northern Europe, it is quite clear that Spanish agriculture was able to adjust and increase output, using new production systems compatible with local natural resources, and changes in factor and product prices. Therefore in Cataluña, foreign demand and improved communications led to the spread of the vine, first along the coast but increasingly during the eighteenth century inland.[9] In Northern Spain the late seventeenth century saw maize being introduces into the rotations, and the potato followed this in the following century.[10] Greater intensity in the rotations in this region was also accompanied by an increase in livestock specialisation and the temporary large-scale migrations of labour. In Valencia the intensification of cultivation, especially of irrigated crops such rice, maize, vegetables and mulberries, was more important than increasing the area cultivated.[11] In eastern Andalucía

[7] Boserup, 1965, p.13. For an economists view of soil fertility, Wright, 1986, pp.6-7. Campos 1973 and González de la Molina and Pouliquen, 1996 provide interesting case studies.
[8] Intensive livestock is excluded, but was unimportant except in the urban dairies of Madrid and Barcelona.
[9] Vilar, 1962.
[10] Anes, 1988, Ch.2., Saavedra and Villares, 1985, pp.456-9 and Villares, 1985, pp.25-30.
[11] Ruiz Torres, 1985, Mateu Tortosa, 1987 and Peris Albentosa, 1995.

the olive spread significantly during the eighteenth and early nineteenth centuries.[12] Finally, although the list could be extended, in Castilla-León information from tithes suggests that the late sixteenth century peaks in output were regained once more by the late eighteenth century, with output increasing through an extension of the area cultivated, rather than yield increases.[13]

However, and as Boserup notes, the switch from a low to a higher level of intensity of cultivation is not necessarily automatic, and there is ample evidence that this phase of intensification was becoming exhausted in some regions by the late eighteenth century.[14] This is particularly true of cereal cultivation, and in Castilla-León and Aragón there were complaints of declining yields, and presumably diminishing returns to labour.[15]

Yet this was not true everywhere, and in Andalucía and Extremadura the problems appear to have been that too much land was kept in pasture, leading to "land hunger" among the local population. Two questions here seem pertinent. First, if cereal prices were increasing from the 1760s and population densities remained low, why did landowners not cultivate more land themselves, or rent it to those who would cultivate it? Second, what explains the fact that if Spain had difficulties feeding a population of 10.4 million in the 1780s, it was producing enough wheat to export small quantities by the early 1820s, even though population had increased by 12.5 per cent, and there had been no obvious changes in technology?[16]

The most frequent explanation for the inelastic supply curve for grains in Spain and large areas of Europe was that rents rose not just because of population growth, the increasing integration of commodity markets or foreign demand, but also because of the nature of property ownership in the Ancien Regime. In the late eighteenth century land ownership was highly concentrated in the hands of the nobility, church and municipalities, and there were also restrictions on cultivation imposed by the Mesta, which partly explains the complaints of land hunger. This would change with the political and military upheavals at the turn of the century, which encouraged a "revolution from below" during the War of Independence producing widespread invasions of common property, the ploughing up of

[12] Bernal, 1979, pp.178-80 and Herr, 1989, pp.584-90.
[13] For a survey of the literature, see Marcos Martín, 1989.
[14] Boserup, 1965, p.41.
[15] Asso, 1798, pp.176-9 cited in Sánchez Salazar, 1988 and Larruga, 1794, vol. 32, p. 235 cited in Yun, 1987.
[16] Anes, 1970, pp.261-2 and Kondo, 1990, p.25.

pastures, and the refusal of many farmers to pay tithes.[17] These gains were then consolidated, and later extended by legal changes associated with the "Liberal Land Reforms" in the nineteenth century allowing farmers the ability to shift resources more easily between crops in response to market signals, and thereby increase output without having to change traditional technologies.[18]

But why did the large landowners and institutions in the eighteenth century not convert more land to cereals if prices were so high? We can advance two reasons. First, the ownership of sheep and goats in Spain was often distinct from that of the land that they grazed. This was certainly true of the Mesta, which by the late eighteenth century controlled about five million animals, three million more than at the start of the century.[19] Wool prices were strong and member of the Mesta benefited from subsidised rents for its pasture during much of the century (Table 2).[20] But the separation of ownership of grazing land and animals was also present with the sedentary village flocks. Once more strong wool prices and the fact that the organisation and control of municipal "common" pastures, especially in Extremadura, was often in the hands of few large graziers discouraged its conversion to grain.[21] In these cases, whatever the level of wheat prices, there was a strong incentive for both the Mesta and local graziers to protect "their" pastures.

If this helps explain why common land was not used for cereal production in greater quantities, we also need to consider why landowners were reluctant to cultivate more of their own land or to rent it to small farmers. First, and as Llopis has argued, the potentially higher rents which landowners might received ignores transaction costs.[22] Renting to large numbers of small tenants would have required landowners to have a larger and more efficient administration. In addition the highly volatile prices in this period increased significantly the risks of small farmers being unable to pay their rents in some years.[23] In

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[17] Fontana, 1985, p.224, Llopis, 1983, pp.143-4, García Sanz, 1985, pp.24-7 and Barquín, 2000, pp.233-6.
[18] These reforms have been sufficiently well studied for us not to have to consider them here. Useful summaries are found in García Sanz, 1985 and Villares, 1997. Very briefly, they include the enforced sale of large areas of church and municipal land, and the abolition of such institutions as the Mesta, Mayorazgo and Señorios.
[19] García Sanz, 1985, p.24.
[20] See especially Llopis, 1982.
[21] Llopis, 1989, pp.282-6. Hoffman, 1996, Chapter 2 has suggested that this was also true in parts of France.
[22] Llopis, 1989, pp.279-82. For the nineteenth century this is treated in more detail in Carmona and Simpson, 2001, Chapter 4.
[23] Fontana (1975 p.25), for example, shows for Medina de Rioseco that the May price (reales de vellon por fanega castellana) increased from 29 in 1800 to 43 in 1801, 66 in 1802, 61in 1803 and 155 in 1804.

areas were there were small farmers, such as Castilla-León, the rise in rents is itself a reflection of the attempts by landowners to protect their incomes in the face of default by some tenants. In turn the high rents and major price fluctuations made it difficult for small farmers to accumulate resources, especially livestock, and perhaps partly accounts for the over-cultivation and declining yields. In general, conditions before about 1820 encouraged landowners to look for large, prosperous tenants, so as to reduce the risks of non-payment of rents.

The recovery of output in the early nineteenth century was caused, as many authors have argued, by the changes affecting land ownership. In particular, pasture became increasingly privately owned. More efficient internal commodity markets produced by transport improvements and the decline in market regulation also made an important contribution.[24] However changes in relative prices perhaps were also important. Landowners now faced lower commodity prices, but higher real wages, conditions that in general were much more favourable for them to rent their land to small farmers, encouraging in turn a more intensive cultivation.[25] More pasture was brought under the plough and, as we shall see, there was also a growth in the cultivation of intensive crops such as vines and olives.

2. The limits to agricultural growth: 1820-1910.

Although the lack of reliable statistics implies that our knowledge of nineteenth century output is limited, few would argue that Spanish agriculture was a success story in 1914.[26] Table 3 shows a number of variables relating to both agriculture and living standards on the eve of the First World War. In the first instance, we see that labour productivity and output per hectare were significantly below levels found in the other countries. Furthermore well over half of the active labour force was employed in the sector, although agricultural output was significantly less than half of GDP. The Spanish economy therefore suffered on two accounts: first, from low labour productivity in agriculture and second, from the fact that most workers were employed in the sector. This poor performance was a major cause,

[24] Changes are summarised briefly in Simpson, 1995, pp.81-90.
[25] See Carmona and Simpson, 2001, Chapter 2.
[26] For an excellent description of the statistical sources, see GEHR, 1991, pp.17-93. A summary of the debates on the long run change is found in Gutiérrez Bringas, 2000, pp.13-19.

although obviously not the only one, of the low living standards compared to the other European countries.

Table 4 looks more closely at the nature of agricultural production and food consumption in Spain in 1900. According to these figures, daily per capita consumption of calories was only 2,096, a figure not so different from that in England in the late eighteenth century.[27] The diet was also low in animal protein. It has been argued that the low per capita consumption of sugar, butter and meat compared to northern Europe was due not only to low incomes, but also to different consumption preferences in Spain.[28] If true, the poor quality of the Spanish diet shown in this Table is perhaps exaggerated. We disagree. Certainly consumers' preference differ both within and across nations, but when Spanish wage levels approached those of northern Europe, consumption of meat, dairy products and sugar increased significantly.[29] Food consumption in 1900 therefore was constrained principally by incomes, and the Spanish diet exhibited characteristics similar to those in Less Developed Economies today, namely it was poor in nutritional quality and food choice was limited.

Although it is difficult to measure accurately, indirect evidence suggests that changes in per capita food consumption over the nineteenth century were probably limited. First the combination of weak market integration and strong harvest fluctuations in the early nineteenth century imply that the average daily consumption found in 1900, about 2,100 calories per person, could not have been much lower in earlier periods.[30] Second, the agricultural sector appears to have employed about two thirds of the workforce in both 1800 and 1900, reinforcing the picture of limited productivity growth.[31] Boserup herself suggests that the greater intensity of cultivation often requires an increase in work effort, so that hourly productivity stagnates, or even falls.[32] The figures in Table 1 show that labour

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[27] Simpson, 1995, pp.284-5.
[28] Flores de Lemus, 1914 cited in Jiménez Blanco, 1986, p.306 and Fernández Prieto, 1999, pp.258-9.
[29] Meat consumption in Spain increased from 25 kilos per capita in 1964 to 64 kilos in 1976, and sugar from 21 to 31 kilos. Ministerio de Agricultura, Pesca y Alimentación, 1980, p.644. Sugar also includes honey. Sugar consumption in 1900 was also limited because of high taxation. Jiménez Blanco, 1986b, p.306 and Martín Rodríguez, 1987, pp.301-23.
[30] A coefficient of variation of 0.3 gives the consumer of the bottom 10 per cent of society a daily intake of only 1,545 calories. Simpson, 1995, pp.284-7. See also Tortella, 1985, p.68. For the negative consequences of poor diets, see Fogel, 1991.
[31] Perez Moreda, 1985, p.56.
[32] Boserup, 1965, especially chapter 5. For a wider use of this model to understand the performances of European agriculture between 1600 and 1900, see Simpson, forthcoming.

output per day did not increase as agriculture became more intensive.[33] A third factor was that, despite a long history of irrigation in areas such as Valencia or Murcia, traditional crops and livestock products still accounted for four fifths of agricultural final output in 1900.[34] In other words new crops, whose output might be expected to grow more quickly, were introduced only slowly during the nineteenth century. Finally, and as we shall see, exports remained relatively unimportant, and were still dominated by traditional crops such as wine and olive oil.

This negative view of agricultural performance does not imply that important changes did not take place. In particular, population more than doubled between 1760 and 1900 and by this second date subsistence crises had been virtually relegated to history.[35] Furthermore a number of local studies show important changes occurring in agriculture, especially over the half century prior to the First World War, and these changes accelerated rapidly in the period between about 1910 and 1936. Given that almost all historians today argue that farmers acted "rationally" in their production decisions, why did change not occur faster? There appear to have been two reasons. First, and covering most of the eighteenth and nineteenth centuries, there were demand restrictions. If structural changes brought about by industrialisation and the increase in urban demand, especially the rapid growth of London, provided the economic stimulus to British farmers to specialise, Spanish farmers enjoyed a much less dynamic market (Table 5). Related to this factor was Spain's notoriously poor communications, again reducing the incentives to specialise.[36] However during the second half of the nineteenth century, Spain's urban population grew, regional markets became better integrated with the completion of the railway network, and falling international freight rates increased opportunities for foreign trade. Changes in demand now began to highlight a second problem, that of intensifying further rotations within traditional agriculture.

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[33] Morilla, Olmstead and Rhode (1999, p.321) find a similar result for US agriculture between 1910 and 1940.
[34] Simpson, 1995. Figures refer to 1897-1901. Cereals and legumes, olive oil, wine and potatoes accounted for 57 per cent, a figure which increased to 86 per cent when livestock products are included.
[35] With perhaps the exception of the consequences of the harvest failure in Andalucía in 1905. Harrison, 1973. As we shall see, relative high levels of risk in Spanish agriculture implied significant fluctuations in employment opportunities.
[36] The poor communications in Spain before the railways can be found in Ringrose, 1970, Fontana, 1975, Gómez Mendoza, 1985, pp.104-8, Madrazo, 1984. However transport costs fell significantly before the railways. Garrabou and Sanz, 1985, pp.43-67 and Barquín, 2000, chapter 4. For the impact of greater market

To a certain extent the eighteenth century intensification of agriculture on the secano continued in the same fashion for much of the following century. For example the area of vines and olives grew by an annual 0.78 and 0.84 per cent between 1800 and 1900, slightly above that for population growth (0.74 per cent).[37] Viticulture benefited from the increased French demand because of phylloxera, and the area increased from about 1.5 million hectares in 1860 to peak at about two million hectares in the mid 1880s. By contrast the area of olives increased from 850 thousand hectares in 1860 to 1.15 million hectares in the late 1880s. In both cases the expansion took place on marginal cereal land or poor pasture. A second example is livestock. Although the total live weight of animals was very similar in 1752 and 1865, there were significant compositional changes.[38] First, work animals such as horses, mules and asses increased by 80 per cent, reflecting the increased area of cereals, and the decline of rough pastures.[39] Second the eight per cent decline in the number of sheep and 31 per cent decline in goats, both animals associated with extensive grazing, was compensated by the 30 per cent increased in pigs.[40] A final area of intensification was found in cereal cultivation. This took two forms. First land, which had been uncultivated, became part of a rotation and second, land that had previously only been occasionally cultivated (rozas), now saw an increase in the frequency. Technology, in the narrowest sense did not changed. Historians are in little doubt that the nineteenth century saw large increases in output which, if yields remained unchanged as seems likely, implies a growth of around two thirds in the area of wheat sown between 1800/9 and 1870/9.[41]

By the 1880s there were two clear indicators that further increases in output were becoming more difficult and, in a Boserupian sense, Spain was becoming overpopulated. First, in parts of Aragón and Castilla there were once more growing complaints of falling cereal yields, and diminishing returns to labour.[42] This was caused because land was being

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specialisation on yields in traditional agriculture, see Kussmaul 1990, chapter 5 for England, and Grantham, 1991 for France.

[37] Simpson, 1995, pp.22-3. Garrabou and Sanz, 1985, pp.130 argue for 1.3 per cent and 1.4 per cent respectively, but part of the discrepancy is because of different dates used.

[38] Zapata, 1986, pp.623-4, García Sanz, 1994 and Villares, 1997, pp.277-8.

[39] It also indicates a greater degree of specialisation, with a relative decline in the importance of cattle as work animals.

[40] García Sanz, 1994, pp. 96-101.

[41] Simpson, cited in Tortella, 1994, Cuadro III-4.

[42] Nadal, 1975, p.78 and GEHR, 1988, pp.50-1. The land: labour ratio of cultivated land fell from approximately 3.7 hectares per worker in 1860 to 3.4 hectares by the end of the century. Calculated from Garrabou and Sanz, 1985, cuadro 19. Active population in agriculture in 1860 is taken as 4.368 million.

sown more frequently and not allowed to recover its natural fertility, and by the steep decline in the supplies of manure to be used on the growing area of sown land. The "potential supply" of manure per hectare fell 42 per cent between 1865 and 1886/91.[43] In other words the traditional systems of production, which had been sustainable with a national population density of around the 30 inhabitants per kilometre found in the mid century, and with imports only in years of harvest failure, became unsustainable at higher population densities. It is also apparent that the sale of common lands and high timber prices led to widespread clearance of montes, producing serious soil erosion in some areas.[44] A second indicator is that contemporaries were becoming increasingly negative with what they perceived as the quality of the nation's natural resources. Therefore, whereas in the mid nineteenth century a few optimistic writers argued that Spain had the potential to export large quantities of cereals, or in the late 1870s that it might become the "bodega of the world", this optimism evaporated in the last decade or two of the century.[45] This is suggested by the timing of Mallada's famous publication in 1890, which argued that only 10 per cent of Spain's land was favourable for agriculture, another 45 per was moderately productive, and the rest was virtually unproductive.[46] But in general Spanish land was probably no less productive in 1890 than it had been forty or fifty years before, and so long as prices of traditional products continued to increase, lower yields were compensated by higher prices. As shown in Graph 1, wheat prices in Castilla increased from the early 1820s and, as argued elsewhere, farmers were able to capture much of the savings achieved by transport improvements in this period.[47] Furthermore, the switch to olives, and especially vines from the 1850s compensated the fall in cereal yields. However, by the early 1880s nearly all prices stagnated or fell, exposing the limits to the second of our Boseruptian phases.

The agrarian crisis of the late nineteenth century has received considerable attention from historians. The impact of the productivity increases in New World agriculture and the transport revolution affected agriculture everywhere, but in Spain change was less that in

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[43] Or 36 per cent between 1865 and 1917/22. Simpson, 1995, Table 5.1.
[44] Kondo, 1990, González de Molina, 1996, pp.56-7 and, most recently, Barquín, 2000, pp. 250-64. Barquín also argues convincingly that output suffered in the period because of drought (pp.284).
[45] "La illusión exportadora" between the 1850s and 1880s is resumed in Robledo, 1993, pp.69-80. See also Pan-Montojo, 1994, pp.139-56.
[46] Mallada, 1890:1969, p.30.

other western European countries, with the exception of Portugal and possibly Italy. In particular, the impact of falling international prices was partly offset by protection, making it more correct to speak of price stagnation. However Spanish agriculture performed poorly in the period. Between 1891/5 and 1910, GEHR suggests that labour productivity fell by 10 per cent, and Simpson by 3 per cent. Prados de la Escosura's index of output, by contrast, is slightly more optimistic and shows a 5 per cent growth between the same dates, or 12 per cent over the longer period, 1875/9 - 1909/13.[48] We argue that neither the international agrarian crisis nor tariffs were the major causes of this poor performance, but rather the difficulties in moving to more intensive forms of agriculture. In the first instance, the weak impact of the international economy on Spanish agriculture can be seen by four variables, namely (a) wheat prices (which fell less than most countries), (b) wages (which rose less in Spain), (c) land rents (which increased more) and (d) emigration (which was less). After considering briefly these differences we shall return to the problems of intensifying domestic agriculture.

The falling transport costs and productivity growth in New World agriculture caused big falls in European prices, but these were less in Spain (Graph 2). Spanish wheat prices rose until1882, when they are 26 per cent above the base level of 1869/72. By contrast, other countries peaked a decade earlier (France in 1871, England in 1873, and Italy in 1874). The drop in Spanish prices between 1882 and 1884 was 26 per cent, compared to only 21 per cent in England, 17 per cent in France and 15 per cent in Italy. However, from each country's respective peaks, the 1884 price level was 40 per cent lower in England and Italy, 32 per cent in France, and 26 per cent in Spain. Therefore although wheat prices fell more suddenly in Spain in the early 1880s during the longer period between 1871 and 1884 the fall is less than elsewhere. After 1890 the combination of tariff protection and devaluation of the peseta stabilised prices at higher levels than in most European countries.[49]

A second difference was the behaviour of wages (Table 6, column 1). Here the evidence is more controversial, as only one series has been used for Spain, namely building workers in Madrid, whose wage, in nominal terms, rose by about 20 per cent. Evidence

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[47] Simpson, 1995, p.89.
[48] GEHR, 1983, cuadro 15, Simpson, 1994, p.52 and Prados de la Escosura, 1995, p.85.
[49] See especially, Palafox, 1991, pp.35-6.

from mining and textile workers suggest the figure may have been nearer 30 per cent. However, even if we accept a faster growth in Spanish real wages than shown in Table 6, the gap with most other European countries remains significant.

Spain also differed because land rents not only increased, but they did so faster than wages (column 2, Table 1.6).[50] The agricultural rental series for Spain are again limited.[51] Robledo's sample shows that there was only one period when more than half of new contracts showed a rental decline of 10 per cent or more (1881/5), and by 1891/5, only 10 per cent of new contracts fell compared to 74 per cent that had increased.[52] More recently, Pérez Picazo gives a rental increase of 39 per cent between 1867 and 1902 in the huerta in Murcia, with growth being registered in all of her five bench marks (1867, 1875, 1885, 1895 and 1902.[53] In Cataluña from the turn of the century, Saguer's index shows limited evidence for a decline in rents.[54] By contrast land prices were 42 per cent lower in Great Britain in 1912 than they had been in 1877, 19 per cent lower in Sweden, 15 per cent lower in France, but 8 per cent higher in Germany and 11 per cent higher in Denmark.[55] Local rent movements were obviously influenced by a wide variety of factors. For example, higher tariffs, or a switch of resources from low yield wheat to high value fruit crops might allow landlords to increased rents at a time of falling cereal prices. However rising rents, especially on cereal land in Castilla-León, are incompatible with the existence of a severe and long agrarian crisis.

Despite the weakness of the sources, factor and product price movements were very different in Spain to those in England, France, and Scandinavian, and suggest that Spain escaped relatively unscathed from the "crisis agraria". This point is reinforced by Table 7, which shows the low share of net migration, and the fact that two thirds of labour was still found in agriculture in 1910. Sánchez Alonso argues that net emigration was only about 185,000 during the whole period between 1882 and 1904, and Pérez Moreda and Tortella have noted that the pull from Spanish cities remained weak prior to 1914.[56] Therefore the

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[50] Note, however, that there is no information given for either Portugal or Italy, two countries that might have had a similar experience to that of Spain.
[51] See O'Rourke, Taylor and Williamson, 1996, pp.522-4 for a list of sources used.
[52] Robledo, 1984, cuadro 18 and Carmona, 1991.
[53] Pérez Picazo, 1991, cuadro 4.
[54] Saguer, 1998.
[55] O'Rourke, 1997, Table 5.
[56] Sánchez Alonso, 1995, Cuadro A3.6; Pérez Moreda, 1985, p.58 and Tortella, 1985, p.72.

evidence that the "crisis agraria" set off a rural exodus of any consequence is limited. This is important because Ireland, for example, a country which was severely affected by the price shocks of these years, and probably saw agricultural output grow at a slower rate than Spain between 1873-1914, enjoyed rising labour productivity because of the outflow of labour.[57] I shall return to this option for Spain later.

Tariffs offered farmers more time to adapt to the new situation, although the depreciation of the peseta was more efficient for this purpose until about 1904.[58] These measures increased Spain's self-sufficiency in wheat so that if imports in 1890/9 were 7.6 per cent of domestic requirements, in 1900/9 the figure was 7.3 per cent, by 1910/9 it had fallen to 5.6 per cent, and in 1920/9 only 4.0 per cent.[59] As self-sufficiency appears to have been an important goal for many contemporaries, this might be considered a success, although potential advantages perhaps were insignificant compared to the impact on welfare caused by the slow growth of the economy and agriculture, especially between 1885 and 1905.[60]

If tariffs and a depreciating peseta protected farmers from the impact of the international economy, the problems of intensifying cultivation with the growing farm population were not so easily solved. The technical restrictions to intensifying cereal cultivation on the secano does not imply there were not alternatives, as suggested in Table 1. Wine differs from most commodities in the 1870s and 1880s because, far from being years of "crisis", they were instead a "golden age" for producers. There is ample evidence of marginal cereal land being planted with vines.[61] However, wine prices weakened from the second half of the 1880s, and exports fell after 1891. Thereafter Spanish growers faced three problems: weak wine prices, product adulteration and phylloxera. The area of vines declined from its peak of almost 2 million hectares in the mid 1880s to 1.24 million in 1914, before recovering 1.4 million by the early 1930s. The response to the disaster in Spain was slow, but this was because of low wine prices facing growers rather than weak action by the state. As we have argued elsewhere, the segmentation of the international

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[57] Turner, 1996, chs.4 and 6 and Guinanne, 1997, p.39.
[58] GEHR, 1980, cuadro 14. See also Sánchez Alonso, 1995, pp.172-92 and especially 2000.
[59] Protection was not limited to just tariffs. In the interwar period a system of licences were the main instrument used for controlling imports. See for example Montojo Sureda, 1945, pp.16-54.
[60] The problems facing Spanish farmers, and especially those of the interior, was not just weak prices but also rising costs and greater income instability Simpson, 2001.

wine market, with France increasingly dependent on its North African colonies, and Britain taxing wine heavily, implied that there were limitations to export led growth.[62]

In the nineteenth century most of the olive oil exported was of poor quality, and used for industrial purposes, and exports stagnated in the last quarter with the availability of other cheaper and more efficient vegetable oils. Between 1880 and 1896 the domestic price of olive oil fell by approximately 20 per cent of what it had been in 1861/79, in part because of the increase in the supply of substitutes, and in part because of the maturing of olive trees planted in earlier periods. Tariffs could protect Spanish olive oil producers from cheap imports of substitutes, but they did nothing to protect export markets. Two major problems faced producers if they were to compete in international markets, namely product quality, and the development of new marketing networks. With respect to quality, the real challenge lay in the processing of the fruit, which was achieved by the introduction of hydraulic presses from the early twentieth century.[63] There was less success in marketing quality olive oil, and over two thirds of oil was still exported in bulk in the period 1926-35, most of which was then blended with other oils. Spain appears to have been slow adopting brand names compared to France or Italy, and in establishing marketing networks.[64] As a result, the international market for both the vine and olive were limited in the half century prior to the Civil War, and the combined areas of both crops was little different in 1936 to what it had been in the 1880s.

One solution found elsewhere in Europe to falling cereal prices was switching into livestock farming. Growing urbanisation, rising nominal wages and falling bread prices, all increased the demand for meat and dairy produces, leading to a significant growth in livestock in many countries during the forty years before the First World War. Thus in Great Britain the area devoted to wheat fell by a half, and cattle increased by 30 per cent between 1870 and 1910.[65] In France, whilst the value of cereals stagnated, the output of meat and dairy produce increased by 48 per cent between 1865/74 and 1905/14. In Italy, cattle increased by 40 per cent between 1880 and 1910, and there were significant increases in the numbers of pigs, sheep and goats. If in Germany there was no fall in the area of

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[61] Crisis Agraria y Pecuaria, 1887-9.
[62] Simpson, 1985, 1995 and 1997. See also Pinilla
[63] Zambrana, 1987, pp.141-51 and Simpson, 1985, pp.162-82 and 1995, pp.167-72.
[64] See Ramón Ramón, 2000.
[65] Sources for this paragraph are cited in Simpson, 1997, p.77.

wheat and rye, cattle numbers rose by a third between 1873 and 1913. In Spain the situation is harder to establish on account of the lack of reliable censuses, but the size of the national herd was not so very different in 1865, as it was in 1917, or indeed 1929. By contrast, the area of wheat grew throughout most of the nineteenth century, and increased by 24 per cent, and production by 34 per cent, between 1905/9 and 1930/4. By 1910, livestock products represented 72 per cent of final agricultural output in the United Kingdom, 44 per cent in France, but just 30 per cent in Spain and 28 per cent in Italy.[66]

Livestock farming increased employment opportunities in agriculture and were an important factor behind the growth in productivity in northern Europe. In Spain it is often argued that the secano made it impossible for intensive livestock husbandry and the small farms and weak communications between the north and the major cities reduce the growth potential. But northern Europe's livestock farmers also saw some other important changes. First, they benefited from the fast growth in nominal wages and urbanisation between 1870-1910, and often a steep decline in the cost of basic foods. By contrast, urban Spain grew slowly from 21.5 per cent of the total population in 1887 to 23.9 per cent in 1910, urban nominal wages increased by 20 or 30 per cent, and the price of bread stagnated rather than fell as we have seen.[67] Second, livestock farmers in those countries with low or no tariffs benefited from a fall in imported animal feed costs, namely barely, maize and oilseed cake.[68] In Spain wheat prices stagnated between 1869/73 and 1909/13 (a 5 per cent increase), but barley prices rose from 53 per cent of the wheat price to 75 or 80 per cent, and maize from 71 to 75 per cent.[69] Oilseed cake, an important feature of the "Second Agricultural Revolution" elsewhere was scarcely used in Spain because of tariffs on imported vegetable oils. The steep decline in international feed costs therefore did not benefit livestock farmers, and one potential area for helping farmers switch away from low yield cereals to higher value livestock was missed.

Although Spain's resource endowments did restrict the flexibility of farmers switching between products in response to changes in factor and product prices, and made

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[66] O'Brien and Prados de la Escosura, 1992.

[67] Urban Spain was, however, only 14.9 per cent in 1860. Figures refer to municipalities of over 20,000 inhabitants and provincial capitals. Reher, 1989, pp.196.

[68] Thompson, 1968 and Van Zanden, 1991, pp. 232.

[69] Sánchez Albornoz, 1975, p.180; García Lombadero, 1971; Carreras (ed) 1989 and Anuario estadistico, 1917, p.259. GEHR, 1980, give a lower figure for barley in the early 1900s, which suggests that the price gap

it difficult to raise yields, the obvious solution to improving labour productivity and raising living standards was by encouraging migration, and the mechanisation of farming activities.[70] Yet contemporary opinion concerning emigration in the half century prior to the Great War changed only slowly from its outright rejection, to a believe that policies should be implemented to retain labour in agriculture.[71] Very few contemporaries saw rural migration (and mechanisation) as a solution to cheap imports, or as a means of raising rural incomes. The association of a prosperous nation with a large agricultural labour force was an unfortunate one for Spanish economic development. The cheap grain from North America was produced on family farms and under conditions of secano not so different from those found in Spain, often using family labour, but with economies of scale achieved through high levels of mechanisation. With similar wheat yields to those found in Spain, labour productivity in cereal farming in the United States increased four times between 1840 and 1910, and another 70 per cent between 1910 and 1930. The figure was significantly smaller in Spain.[72] We shall return to mechanisation in section 4.

This generally pessimistic picture of Spanish agriculture between 1880 and 1910 contrasts with a number of local studies, which emphasise change.[73] We do not deny the importance of these changes, and especially their impact after the First World War. However, given the weight of the traditional secano within the national agriculture the impact of dynamic, but local changes, was likely to be small. Furthermore, from what economists and economic historians have shown us about the impact of technological change on the growth of total factor productivity, we should not be surprised that change was so slow. We need only look at the Industrial Revolution in Britain where Mokyr has written:

> "Clearly it is unwarranted to expect that major technological breakthroughs will lead to more or less simultaneous increases in productivity. Most of the payoffs to such breakthroughs occurs in the more remote future and is spread over a long period."

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closed quickly from around 1910. For relative wheat:meat prices in Madrid, See Simpson, 1997, figure 3.

[70] One historian has described British agriculture in the period 1870 and 1914 as being "the first of Britain's major industries to go into decline", with the result that "British consumers enjoyed cheap food, the cheapest in Europe, and British farmers and farm workers enjoyed higher real incomes". Thompson, 1996, p.59.

[71] Sánchez Alonso, 1995, ch.2; for agrarian policies, see especially, Robledo,1993, pp.75-94.

[72] Simpson 1995, p.228 and 1992.

[73] See for example the recent works by Pinilla, 1995, Domínguez Martín and Puente, L. de la, 1997 or Murcia

The consequences of local change in farming techniques in the late nineteenth century were, however, becoming to make themselves felt during the quarter century prior to the Civil War.

3. Productivity growth and agricultural change: 1910-1930.

Between 1909/13 and 1929/33, agricultural final output increase by 28 percent in real terms, from 3.7 to 4.7 million pesetas, even though the agricultural area increased by only 6 per cent and the male labour force fell by over 800,000, or 18 per cent.[74] This is an impressive performance. By the early twentieth century, a number of critical factors were coming together, which stimulated growth. On the demand side, Barcelona's and Madrid's population increased by 82 per cent between 1900 and 1930, so that each had around a million inhabitants by 1930 (Table 5). Per capita incomes doubled between about 1890 and 1929. Transport costs continued to fall, albeit slowly, especially with the growing importance of road transport. But just as important were changes on the supply side. In particular, the obstacles placed by natural resources on the intensification of agriculture in the late nineteenth century were gradually solved, although progress was virtually halted in the 1930s and 1940s.

First artificial fertilisers promised to have an important impact on crop yields given the shortage of manure in traditional agriculture. Farmers in a number of locations were experimenting in the late nineteenth century and rice and orange growers in Valencia, for example, had by the 1880s overcome the initial technical problems experienced in adapting artificial fertilisers to their crops.[75] The next couple of decades saw the extension of irrigation and the introduction of new crops such as sugar beet, which encouraged the wider use of fertilisers. Although less than 150,000 tons of artificial fertilisers were used in 1900, growth would be almost tenfold over the next three decades.[76] The quantitative jump was only achieved when artificial fertilisers spread to the secano, and progress here was slow for a variety of reasons. One obstacle was that the scientific basis for applying artificial fertilisers to the secano was little studied prior to the First World War, and most technical

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[74] Simpson, 1995, Table 1.4.

[75] Crisis Arrocera, 1887, p.73 and Arévalo y Baca, 1886, pp.5-6, quoted in Calatayud, 1989, p.73. This region was one of the first in Europe to use guano in the 1840s. Giralt i Raventós, 1978, Garrabou, 1985 and Mateu Tortosa, 1993.

[76] Consumption averaged around 1.3 million tons in the early 1930s. Gallego, 1986, apéndice 2.

information available to farmers simply cited yield improvements obtained elsewhere, especially in France. Climate and soil types are very different in France, and the poor results experienced by Spanish farmers who ignored this fact inevitably slowed diffusion. Farmers also suffered because of the widespread fraud in the manufacture of fertilisers, a problem only solved with scientific testing carried out by government laboratories and bulk purchases by co-operatives in the 1920s. Finally the steep decline in prices associated with the rapid diffusion of fertilisers, which was found in other countries, only appeared in Spain after the First World War.[77] Although by the late 1920s large numbers of farmers were using artificial fertilisers, in terms of mineral content, animal manure and other organic material still accounted for about two-thirds of all fertilisers in 1933,[78] and wheat yields remained stubbornly below one ton a hectare until the 1960s. The evidence suggests that the technical bottleneck had changed from that of acquainting farmers with artificial fertilisers, to a new problem, namely the weak response of traditional varieties of wheat to artificial fertilisers.[79] However, as Table 8 indicates, those periods when relatively large quantities of fertilisers were used, such as 1926/35 or 1951/60, were associated with an important extension in the area cultivated with cereals. In other words prior to about 1960 artificial fertilisers permitted a more intensive use of land by extending the area of cultivation, rather than by increasing wheat yields.[80] Finally, greater fertiliser usage was often only one of a number of inter-related changes, and without accompanying changes in other areas, such as the provision of irrigation, new crops or improved marketing systems, the use of chemical fertilisers would have been considerably smaller.

Irrigation was another area where changes had been occurring before 1914, but which became more widespread over the next couple of decades. In the second half of the nineteenth century there had been important technical changes in the extraction of ground water, especially in parts of Valencia.[81] Despite these changes, ground water only supplied 7.2 per cent of irrigated land in 1916, and the nation's reservoir capacity in 1900 was only

[77] The price of superphosphates fell compared to wheat by a third in the 14 years prior to the First World War, when they rapidly increased. By the late 1920s they were half the price they had been at the end of the War. See Simpson, 1995, Figure 5.1 and Pujol, 1998, pp.156-7 and 164.
[78] Gallego, 1986, p.197 and cuadro 5.
[79] Simpson, 1995, pp.124 and Pujol, 1998, p. 167.
[80] There is also ample evidence of greater diffusion of vertedera ploughs from the late nineteenth century which also encouraged these changes.

78 million cubic metres, with much of this used for urban use rather than irrigation.[82] Most irrigation therefore was achieved by simply diverting the natural flow of streams and rivers. However, during the twentieth century there was the reservoir capacity increased significantly from just 78 million cubic metres to 3,620 by 1940 and to 42,201 in 1980.[83] Farmers successfully extended the areas of high value crops and by the Second Republic about 29 per cent of all crops, in terms of value, were irrigated.[84]

This growth in the relative importance of irrigation was the final phase of the Boseruptian intensification of farming during our period.[85] In theory, at least, we might expect that the relative importance of export products would also reflect the growing intensification of farming. But this is too simple. It is true that wool from extensive sheep farming, which was the leading export product for centuries, was replaced by wine from intensively cultivated secano in the late nineteenth century, and thereafter oranges from irrigated land. But export capability was also partly determined by how open foreign markets were, the international wine trade for example being especially segmented, as we have seen. It is also difficult to measure quality changes that were often crucial if market share was to be maintained or increased in international markets. This was especially true, as we have seen, with olive oil. However, and despite its shortcomings, Table 9 does suggest two important conclusions. First exports of "extensive products" had become unimportant by the mid nineteenth century, if not before. Second, "intensive products" were an important share of exports before the First World War, and therefore before agricultural productivity started growing significantly.

Despite changes in composition, exports remained too small to change the major characteristics of Spanish farming, with the area of cereals, legumes, vines and olives falling only marginally from 86 per cent of crop area in 1891/95 and 85 per cent in 1931.[86] What was required were changes on the secano and, in particular, mechanisation. Domestic wheat production between 1880 and 1936 divides into two very distinct periods. Prior to

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[81] Garrabou, 1985, pp.51-2 and 98-107, Calatayud, 1990, and Calatayud and Martínez Carrión, 1999, pp.15-39.
[82] Simpson, 1995, Tables 6.1, 6.2 and 11.8.
[83] AEA año 1980, p.10.
[84] Simpson, 1995, p.132.
[85] Technical change with irrigation practices over the last few decades have also produced significant productivity increases. Stall-feeding livestock has also produced similar results.
[86] Calculated from GEHR, 1983, p.243.

the first years of the twentieth century there were few changes in the area sown, the use of artificial fertilisers remained rare, the rural exodus had hardly started and there was little mechanisation. In the second period a greater use of artificial fertilisers contributed to a significant increase in the area of wheat, labour started leaving the land in large quantities, and more farms were mechanised. As labour left the land, wages increased by about 150 per cent, compared to the 50 per cent increase in the price of wheat.[87] Changes in wage levels explain the significant changes in the temporal and spatial distribution of the cereal harvest machinery in Spain during the half-century prior to the Civil War.[88] But they were not the only factors. In Navarra, for example, co-operatives played an important role in the diffusion of machinery. Furthermore, as Olmstead and Rhode have argues for America's Midwest, reapers encouraged co-operation amongst farmers, which suggests that they were an appropriate technology for the family farms of this region.[89] Both of these are important institutional arguments for the greater density of reapers on the small farms of Spain's interior than on the latifundios of Andalucía.

Historians have therefore been right in emphasising the dynamic features of Spanish agriculture, especially during the quarter century between 1904 and 1929. Yet if Spain in the early twentieth century was closing slightly the productivity gap with other countries it remained large and rural poverty was still widespread. World depression, domestic political volatility, civil war and finally autarky produced twenty five years of failure and stagnation, which implied that the advances prior to 1929 were only resumed again from the early 1950s.

Conclusion.

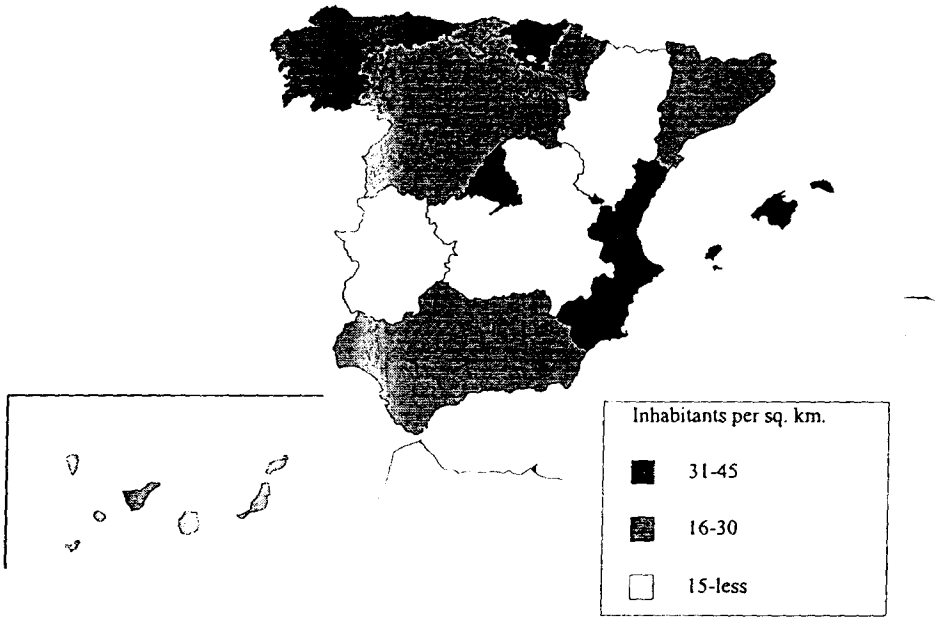
Why was output still so low in 1936? If we assume that farmers acted rationally in the face of factor and product markets, and that farm organisation was not a major source of inefficiencies, then the list of possible exogenous factors to explain the productivity gap between the Mediterranean and northern Europe is short. In this paper a number of factors have been cited. First demand remained weak because of low incomes, limited

[87] Reher and Ballesteros, 1993, pp.138 and 146-7. Both figures refer to Madrid. Rural wages, such as those in Andalucía, increased from 100 in 1914 to 250 in 1930. Calculated from Anuario Estadístico, various years.
[88] Simpson, 1987, pp.284-97 and 1995, pp.158-67.
[89] Olmstead and Rhode, 1995, pp.42-53 and Carmona and Simpson, 2001, Chapter 3. This is an important criticism of the "threshold" model used by David, 1975.

urbanisation, a widely dispersed population and high transport costs. Growth in foreign demand was also weak, especially after 1914.[90] A second factor was the difficulty in adapting farming techniques developed in northern Europe to Spanish conditions. This implied that alternatives to suit local conditions had to be developed domestically, a process that was in general slow to occur. A third point was the delay in rural migration that only became significant after 1900, but was restricted after 1918 because of changes in the international economy. Fourth, high tariffs kept large numbers of workers in the sector who would otherwise have been forced to look for a living elsewhere, and slowed the diffusion of farm machinery and new crops.[91] Finally, there was often a difficulty in creating fixed assets though labour intensive investment. One exception was viticulture in Cataluña, which permitted the use of large inputs of labour to create a high value product. Labour inputs were even greater with irrigation crops. However, over much of the secano, demand in agriculture was highly seasonal, leading to large amounts of underemployed labour. Agrarian productivity in Spain was limited not so much because of low output per day, but because of the large number of days with little or no work.[92]

[90] Tena, 1992.
[91] Tariff protection had negative consequences in three areas, namely higher food prices, a slower switch away from cereals, and a delay in the rural exodus. Important as they are, tariffs can be blamed for only a part of Spain's agrarian backwardness. Simpson, 1997.
[92] See especially Simpson, forthcoming.

Population density in Spain, 1797



Europe, population densities in 1750

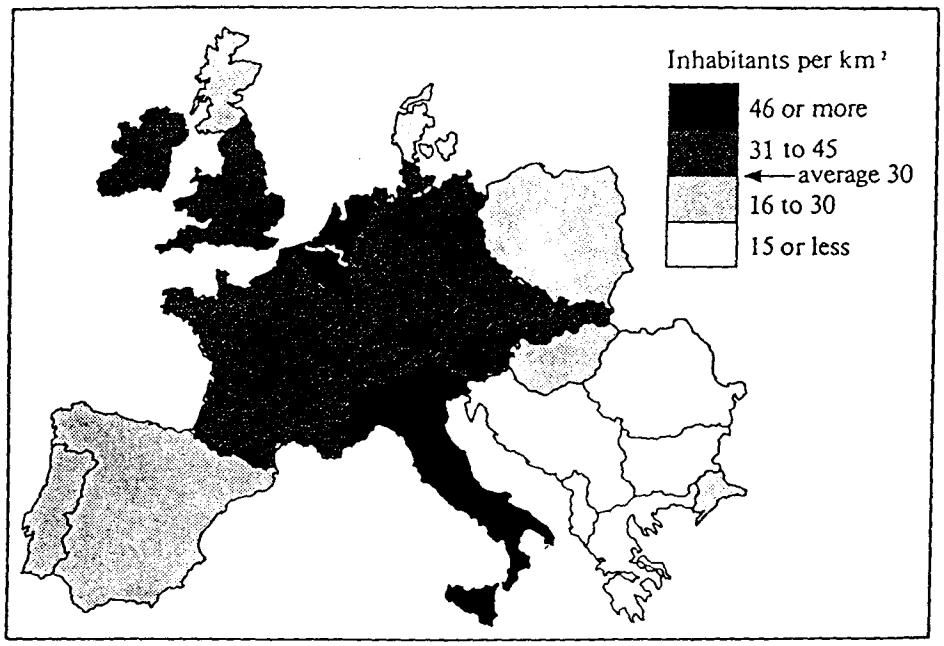


TABLE 1

WORK INTENSITY OF DIFFERENT FARMING SYSTEMS.

Type of agriculture	Labour employed per year. Number of days.	Output per day of employment, in pesetas	Hectares required to obtain a gross income of 5000 pesetas
Rozas	8.8	11.1	
Cuarto	12.5	12.8	125,0
Tercio	17.5	12.9	66,7
Año y vez	25.0	14.0	28,6
Olives (normal)	31.2	11.2	14,3
Vines (normal)	43.8	11.3	10,1
Olives (intensive)	62.5	11.2	7,1
Vines (intensive)	237.5	6.3	3,3
Irrigation (normal)	175.0	12.0	2,4
Irrigation (intensive)	375.0	10.7	1,25

Output per day has been calculated by dividing the "importe de los productos" per hectare by the number of days worked.

Source: Carrión, 1932: 1977, pp.324, 341-2.

TABLE 2.

FACTOR AND PRODUCT PRICE CHANGES IN EIGHTEENTH CENTURY SPAIN.

	CASTILLA			ANDALUCÏA			BARCELONA		
	Pasture	Wool	Wheat	Wheat	Olive Oil	Wages	Wheat	Wine	Wages
1681/00		94		114	126	136	91	86	92
1701/20	100	100	100	100	100	100	100	100	100
1721/40	103	135	123	88	84	85	76	76	86
1741/60	110	136	149	81	88	76	79	65	77
1761/80	124	164	231	148	124	98	103	95	86
1781/00	138	202	311	175	178	144	153	119	141

Sources: Pasture for the Mesta (summer and winter), wool (Villacastín, Segovia) and wheat prices (Villacastín) are in reales. Llopis, 1982, pp.80-90.

Rest of prices and wages (jornaleros in Andalucía and maestro albañil in Barcelona) are in silver. Feliu, 1991.

TABLE 3.

INDICATOR OF AGRARIAN PERFORMANCE AND LIVING STANDARDS IN EUROPE, CIRCA 1910.

	Spain	France	Italy	Great Britain	Germany	Netherlands
Labour productivity	32	118	45	100	118	92
Output per hectare	55	136	161	100	205	237
Real wages	48	75	44	100	84	73
Literacy rate estimates	0.42	0.96	0.47	0.96	0.97	0.97
Crude death rates	23.1	17.8	19.9	13.5*	16.2	13.6
Child death rates	149	111	140	105	162	108
Stature	1633	1661	1654			1712

Sources:

- Labour productivity and output per hectare: O'Brien and Prados de la Escosura, 1992, Table 6.
- Real wages (1905) as a percentage of Great Britain: Williamson, 1995, p.180.
- Literacy rate estimates: O'Rourke and Williamson, 1997, Table 4.
- Crude death rates and child mortality: Mitchell,1975.
- Stature: Quiroga, forthcoming.

TABLE 4

PRODUCTION AND CONSUMPTION IN SPANISH AGRICULTURE, circa 1900

	Gross output/hect. sown (pesetas)	Area sown (000s Hectares)	Calories per person Per day
Wheat	134*	3733	998
Barley	107*	1376	0
Maize	295	465	90
Rice	1882	34	63
All cereals		6815	1311
Vines	293	1429	166
Olives	186	1197	260
Oranges	1214	42	11
Almonds	610	41	
Potatoes	819	243	201
Sugar Beet	1095	21	48
Other crops		1936	469
Total	320	11724	2466

Years refer to an average for 1897-1901

* Figures for wheat and barley have been divided by two to take into account one year's fallow.

Sources: Simpson, 1989, cuadro 5 and 1995 Appendix 1a and 1b.

TABLE 5

a. URBAN POPULATION AND AGRICULTURAL EMPLOYMENT IN DIFFERENT COUNTRIES.

a.1800

	% population working in agriculture	% of population living in urban settlements	Size of capital city in 000s
Spain	63	11.1	167
France	55	8.8	581
Southern Italy		15.3	427
Portugal		8.7	180
England and Wales	36	20.3	865

b. URBAN POPULATION AND AGRICULTURAL EMPLOYMENT IN SPAIN.

	% population working in agriculture	% of population living in urban settlements	Combined size of Barcelona and Madrid in 000s
1800	63	12.9	257
1860		14.9	488
1900	70	23.9	1073
1930	47	26.8	1958

Sources: (a) Allen, 2000, Table 1 and De Vries, 1984, table 3.7 and appendix 1. Urban settlements taken as 10,000 or more inhabitants.

(b) Reher, 1989, Table 9.6 and Luna Rodrigo, 1988. Urban settlements are taken as 20,000 inhabitants and provincial capitals.

TABLE 6

WAGES, FARM RENTS AND GDP PER CAPITA IN EUROPA, 1870-1910.

	Real wage growth per urban worker 1870-1913	Wage-rental ratio 1870-1910	Real GDP per capita 1870-1913
Spain	0.44	-0.43	1.11
Denmark	2.63	2.85	1.57
France	0.91	1.80	1.30
Germany	1.02	0.87	1.63
Great Britain	1.03	2.54	1.01
Ireland	1.79	4.39	s.d.
Italy	1.74	s.d.	1.28
Netherlands	0.64	s.d.	1.01
Norway	2.43	s.d.	1.31
Portugal	0.37	s.d.	0.69
Sweden	2.73	2.45	1.46
Europe	1.39	2.07	1.25
New World*	1.14	-3.03	1.66

Growth per cent per annum
* includes Argentina, Australia and Canada and the United States.

Source: O'Rourke and Williamson, 1997, Table 2.

TABLE 7.

MIGRATION AND EMPLOYMENT IN EUROPEAN AGRICULTURE.

	Persons adjusted net migration rate 1870-1910 (per 1000)	Persons adjusted cumulative population impact 1910 (%)	Date when the absolute decline in the agricultural labour began	% in agriculture when absolute numbers began to decline
Spain	-1.16	- 5	1950	48.4
Denmark	-2.78	-11	1930	35.6
France	-0.10	0	1921	41.5
Germany	-0.73	- 3	1907	36.8
Great Britain	-2.25	- 9	1851	21.9
Ireland	-11.24	-36		
Italy	-9.25	-31	1936	48.2
Netherlands	-0.59	- 2	1947	19.3
Norway	-5.29	-19	1931	35.3
Portugal	-1.06	- 4	1950	48.4
Sweden	-4.20	-15	1920	40.2
Europe	-3.08	-11		

Sources: Net migration rate and cumulative impact, Taylor and Williamson, 1997, Table 1: Agricultural labour force, Grigg, 1982, Table 11.

TABLE 8

Changes in wheat area and yields, 1905-1980.

	Area sown ('000 hectares)*	Production ('000 tons)	Yields (tons per hectare)
1905/14	3.805	3.330	0,88
1939/50	3.828	3.238	0,85
1926/35	4.610	4.128	0,90
1951/60	4.300	4.180	0,97
1961/70	4.069	4.637	1,14
1971/80	2.970	4.624	1,56

*Includes both secano and irrigated areas.

Sources: AEPA and AEA (various years).

TABLE 9

EXPORTS BY INTENSITY OF PRODUCTION.

	1849/53	1879/83	1909/13	1925/29
Extensive products	9.5	3.3	9.8	5.5
Medium intensity	60.6	78.6	41.8	40.7
Intensive products	30.0	18.1	48.4	53.8
Sherry	17.7	5.3	6.4	5.9
Intensive products without sherry	12.3	12.8	42.0	47.9

Extensive produce includes lana and pieles; medium intensity produce includes cereales y legumes, harina, ganado en vivo, vino de mesa, aceite de oliva and half exports of frutos secos; intensive products include arroz, frutas verdes, hortalizas y tubérculos, vino de Jerez y generosos, conservas vegetales and half exports of frutos secos.

Source: Calculated from Gallego y Pinilla, 1996, Apéndice 2.

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